

Expected Performance of Ozone Climate Data Records from Ozone Mapping and Profiler Suite Limb Profiler

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[ABSTRACT]

The Ozone Mapping and Profiler Suite Limb Profiler (OMPS/LP) was launched on board of the Soumi NPP space platform in late October 2011. It provides ozone-profiling capability with high-vertical resolution from 60 km to cloud top. In this study, an end-to-end Observing System Simulation Experiment (OSSE) of OMPS/LP ozone is discussed. The OSSE was developed at NASA's Global Modeling and Assimilation Office (GMAO) using the Goddard Earth Observing System (GEOS-5) data assimilation system. The "truth" for this OSSE is built by assimilating MLS profiles and OMI ozone columns, which is known to produce realistic three-dimensional ozone fields in the stratosphere and upper troposphere. OMPS/LP radiances were computed at tangent points computed by an appropriate orbital model. The OMPS/LP forward RT model, Instrument Models (IMs) and EDR retrieval model were introduced and pseudo-observations derived. The resultant synthetic OMPS/LP observations were evaluated against the "truth" and subsequently these observations were assimilated into GEOS-5. Comparison of this assimilated dataset with the "truth" enables comparisons of the likely uncertainties in 3-D analyses of OMPS/LP data.

This study demonstrated the assimilation capabilities of OMPS/LP ozone in GEOS-5, with the monthly, zonal mean (O-A) smaller than 0.02ppmv at all levels, the rms(O-A) close to 0.1ppmv from 100hPa to 0.2hPa; and the mean(O-B) around the 0.02ppmv for all levels. The monthly zonal mean analysis generally agrees to within 2% of the truth, with larger differences of 2-4% (0.1-0.2ppmv) around 10hPa close to North Pole and in the tropical tropopause region, where the difference is above 20% due to the very low ozone concentrations. These OSSEs demonstrated that, within a single data assimilation system and the assumption that assimilated MLS observations provide a true rendition of the stratosphere, the OMPS/LP ozone data are likely to produce accurate analyses through much of the stratosphere. Additional studies are needed to evaluate the importance of the extremely high vertical resolution of the OMPS/LP ozone data.